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COST OF KEEPING FARM HORSES AND COST OF HORSE LABOR.

A Study of Records for 316 Horses on 27 Farms in Illinois, Ohio, and New York.

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Inasmuch as horses are the principal source of power on the average farm, the cost of horse labor is of vital concern to the farmer. It has a bearing on the net return of every farm enterprise, yet its significance is not likely to be appreciated fully by one who has not made a study of the subject. This, in large measure, is because the cost of horse labor, unlike that of hired-man labor, is chiefly made up of items of expense representing materials furnished by the farm and not involving a direct cash outlay.

The purpose of this bulletin is to show how the annual cost of keeping a farm work horse and the cost per hour worked may be determined, and to point out that the cost per hour worked is the true measure of the profitableness of a horse to its owner. In other words, it is desired to emphasize the fact that, other things being equal, the horse that costs $100 a year in feed, shelter, etc., and works 1,000 hours in that time, is more economical than the horse that costs but $75 for keep and works but 500 hours, since the former costs but 10 cents per hour worked, while the latter costs 15 cents.

Note.—This bulletin should be of value to all who are interested in the study of farm-management problems.

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SOURCES OF DATA.

The data presented herein were obtained from cost-accounting records for 316 horses on 27 farms in three States, namely, Illinois, Ohio, and New York. In Illinois and New York the data were obtained by the Office of Farm Management through direct cooperation with the farmers. The Ohio data were obtained in a like manner by the cooperative department of the Ohio Agricultural Experiment Station in cooperation with the Office of Farm Management. The cost records kept on these farms consisted of detailed daily reports of all labor and financial transactions, complete inventories, and other necessary information for determining not only the costs and returns of farm work horses, but also the costs of operation and returns from the entire farm business. (See Table 1.)

TABLE 1.—*Sources of data.*

State.	Number of farms studied.	Number of yearly records.	Years for which data were collected.	Total number of horses included.
Illinois	10	18	1912–13–14	154
Ohio	7	16	1909–10–11–12	72
New York	10	18	1911–12–13–14	90
Total	27	52		316

In Illinois data were procured in the counties of Cass, Menard, and Sangamon. The principal crops raised on the 10 farms studied were corn, oats, wheat, and hay. The live stock fed were hogs and cattle.

The 7 farms in Ohio were located, respectively, in Coshocton, Madison, Adams, Crawford, Greene, Holmes, and Trumbull Counties. The principal crops raised on these farms were corn, oats, wheat, and hay. The live stock fed were hogs and cattle. One farm varied from the others in that dairying and trucking were carried on.

The New York data were collected in the counties of Orleans, Wyoming, Genesee, Monroe, Niagara, and Seneca. The principal crops raised on the 10 farms visited were oats, wheat, beans, potatoes, and hay. Orcharding also was carried on extensively. Little live stock was kept, with the exception that on one farm dairying was followed.

SUMMARY OF COSTS.

An itemized summary of the annual average cost per horse, and the percentage each item of cost is of the total gross cost, for the horses studied in each State, will be found in Table 2.

TABLE 2.—*Itemized summary of average annual costs and credits per horse, by States (27 farms, 316 horses).*

GROSS COSTS.

Item.	Illinois (154 horses).		Ohio (72 horses).		New York (90 horses).	
		Per cent.		*Per cent.*		*Per cent.*
Feed and bedding [1]	$68.75	65.0	$76.86	58.8	$91.25	57.1
Labor	13.99	13.2	27.48	21.0	22.09	13.8
Interest	7.90	7.4	8.66	6.6	9.43	5.9
Stabling	4.95	4.7	7.18	5.5	12.98	8.1
Use of equipment	3.82	3.6	5.00	3.8	5.85	3.7
Shoeing	.86	.8	2.35	1.8	4.56	2.9
Depreciation	3.46	3.3	.....	.....	11.56	7.2
Net loss on colts	.04	.....	1.24	1.0	.....	.....
Miscellaneous	2.12	2.0	1.90	1.5	2.09	1.3
Total	105.89	100.0	130.67	100.0	159.81	100.0

CREDITS.

Manure	$5.24	.....	$8.20	.....	$13.36	.....
Horse appreciation	.....	.....	2.10	.....	.....	.....
Colt profit	.....	.....	.....	.....	1.43	.....
Total	5.24	.....	10.30	.....	14.79	.....

NET COST.

Cost of keeping, less credits	$100.65	.....	$120.37	.....	$145.02	.....

[1] The item of bedding is included with feed, because on many farms straw was used both as a feed and as bedding, and owing to the fact that refuse from the mangers was used for bedding, it was contrary to actual practice to attempt to make bedding a separate item.

The gross costs, made up of the items of feed and bedding, labor, interest, stabling, use of equipment, shoeing, depreciation, loss on colts, and miscellaneous charges, are partially offset by credits for manure, appreciation of young work horses, and profits on colts. The difference between the gross cost and the sum of these credits is the net cost of keeping a horse a year. This is, of course, the cost of the work performed by the horse. It will be seen that, with few exceptions, each item of cost was greater in Ohio than in Illinois, and still greater in New York. This variation in average cost is discussed in the following analysis of the several items of cost and credit.

FEED AND BEDDING.[1]

The term "feed and bedding" includes all grain, roughage, and pasture used by horses. Accurate feed records are difficult to obtain, so that in determining the feed cost shown herein not only the feed records but also the yearly inventories of feeds and the amounts raised and purchased were all considered in arriving at the feed cost.

[1] In the following pages, all references to feed include both feed and bedding.

In each State the feed and bedding costs were more than one-half of the total gross costs of keeping the horses. These costs were about $69 in Illinois, $77 in Ohio, and $91 in New York, varying according to kinds, quantities, and prices of feed and bedding used.

KINDS OF FEED.

The number of kinds of feed used were 11 in Illinois, 16 in Ohio, and 18 in New York. In all, there were 26 different kinds. Table 3 shows the feeds used with the quantity and value of each per horse, by States.

TABLE 3.—*Kinds of feed used, average quantity, and value per horse, by States (27 farms, 316 horses).*

Kind of feed.	Illinois (154 horses).		Ohio (72 horses).		New York (90 horses).	
	Quantity per horse.	Cost per horse.	Quantity per horse.	Cost per horse.	Quantity per horse.	Cost per horse.
Corn.....bushels..	57.20	$30.90	26.50	$16.12	10.92	$8.36
Oats.....do....	38.24	13.17	53.10	22.20	42.58	19.94
Hay.....tons..	.77	9.32	2.09	27.44	3.28	43.47
Straw.....do....	1.06	5.58	.76	3.43	1.38	7.04
Fodder.....do....	.22	.96	.45	1.55	.03	.17
Bran.....pounds..			85.50	1.18	184.50	2.51
Shorts.....do....			4.07	.06		
Chop.....do....			18.70	.22	38.00	.69
Ground feed.....do....					140.00	2.10
Wheat.....bushels..					4.33	3.55
Rye.....do....			.29	.24	.58	.47
Barley.....do....					.26	.16
Hominy.....pounds..					50.90	.66
Oil meal.....do....			29.50	.54	.85	.02
Alfalfa meal.....do....	27.35	.31				
Cottonseed meal.....do....			4.75	.08		
Stock food.....(?)....	(?)	.05			(?)	.09
Oat hay and sheaf oats.....tons..	.06	.71	.01	.07		
Sheaf rye.....pounds..			10.40	.06		
Sorghum.....tons..			.01	.08	.03	.34
Bean pods.....do....					.02	.12
Silage.....do....	.02	.05				
Potatoes.....bushels..			.41	.09		
Carrots.....do....					.25	.06
Pasture (grass).....months..	4.60	7.36	2.26	3.50	1.13	1.50
Pasture (corn stalks).....do....	.33	.33				
All feeds.....		68.75		76.86		91.25

The principal feeds used were corn, oats, hay, straw, and pasture. In Illinois these represented 97 per cent of the total feed cost. In the other two States this percentage was less, being 94.5 in Ohio and 88 in New York. Corn was the principal grain fed in Illinois, oats in Ohio and New York. The greatest quantity of hay per horse was fed in New York, and the most pasture per horse was used in Illinois.

In Illinois very little horse feed was purchased, the concentrate ration being made up primarily of home-grown grains. Corn and oats, with few exceptions, were fed whole. On some farms hay was fed sparingly during idle periods of the year. Straw was used for bedding, and in some cases for feed during the winter months. From

about the middle of April to November the horses were out on grass pasture at night and through the day when not working. In some cases they were pastured on stalk fields after the corn was harvested.

In Ohio a slightly greater quantity of feed per horse was purchased than in Illinois, and less pasture was used, thus necessitating the use of a greater quantity of hay, straw, and other roughage. Corn and oats were sometimes ground and mixed with other feeds that were bought.

In New York a still greater quantity of feed was bought. Often corn and oats were ground, and mixtures of these with purchased feeds were fed. On some farms horses were never pastured. In New York the average time per horse on pasture was 1.13 months, and in Ohio 2.26 months, as against 4.93 months in Illinois. The quantity of hay used increased as the time of pasture decreased.

COST OF FEEDS.

In Table 4 the feeds are divided into three classes, namely, grain, roughage, and pasture, by States.

TABLE 4.—*Average quantity and cost of grain, roughage, and pasture per horse, by States (27 farms, 316 horses).*

Kind of feed.	Illinois (154 horses).		Ohio (72 horses).		New York (90 horses).	
	Average quantity per horse.	Average cost per horse.	Average quantity per horse.	Average cost per horse.	Average quantity per horse.	Average cost per horse.
Grain.....pounds..	4,500	$44.93	3,347	$40.71	2,691	$38.55
Roughage[1].....pounds..	4,224	16.13	6,660	32.65	9,513	51.20
Pasture.....days..	148	7.69	68	3.50	34	1.50
Total.....	.....	68.75	.....	76.86	.....	91.25

[1] The item "roughage" includes, along with hay, straw, etc., small amounts of succulent roughage, such as silage and roots.

Referring to the figures for the different States, it will be seen that the average total of grain per horse is less in Ohio and New York than in Illinois, while the average total of roughage per horse is greater. This is largely due to the greater relative cost of concentrated feed in the East. Thus the price of corn in New York, as compared with Illinois, is 42 per cent greater, and of oats 36 per cent greater, while the price of hay is only 9 per cent more in New York than in Illinois. In Table 5 is shown the average price of each feed, by States.

TABLE 5.—*Average price of each feed, by States (27 farms, 316 horses).*

Kind of feed.		Illinois (154 horses).	Ohio (72 horses).	New York (90 horses).
Corn	bushel	$0.5403	$0.608	$0.766
Oats	do	.3445	.418	.4684
Rye	do	.....	.836	.810
Sheaf rye	hundredweight	.....	.60	.....
Barley	bushel	.....	.....	.615
Shorts	hundredweight	.....	1.50	.....
Bran	do	.....	1.385	1.36
Chop	do	.....	1.20	1.82
Ground feed	do	.....	.....	1.50
Oil meal	do	.....	1.835	1.80
Cottonseed meal	do	.....	1.56	.....
Alfalfa meal	do	1.15	.....	.....
Hominy	do	.....	.....	1.30
Wheat	bushel	.....	.....	.82
Potatoes	do	.....	.22	.....
Carrots	do	.....	.....	.25
Hay	ton	12.16	13.14	13.27
Straw	do	5.24	4.50	5.08
Fodder	do	4.25	3.43	5.00
Oat hay and sheaf oats	do	11.67	10.80	.....
Sorghum	do	.....	8.00	10.00
Bean pods	do	.....	.....	7.20
Silage	do	3.50	.....	.....
Pasture (grass)	month	1.60	1.55	1.34
Pasture (corn stalks)	do	1.00	.....	.....
Average price per ton of all grain		19.97	24.33	28.65
Average price per ton of all roughage		7.64	9.80	10.76

PRICES OF FEEDS.

The feed costs given in the foregoing tables are based on the values of feeds at the farm for feeds raised, and on actual cash costs for feeds purchased. These costs for each year were governed somewhat by market prices, and the average value on each farm was influenced by the quality of the feed, and the relative quantity used at different prices.

It will be seen that the average price per bushel of corn in Ohio was $0.067 higher than the average price in Illinois, and in New York $0.158 higher than in Ohio. Likewise, the average price per bushel of oats in Ohio was $0.074 higher than the average price in Illinois, and in New York $0.05 higher than in Ohio. The average price per ton of hay for Ohio was $0.98 higher than for Illinois and that for New York $0.13 higher than that for Ohio.

A comparison of the variations in grain prices in the three States with figures from the Yearbooks of the U. S. Department of Agriculture for the years 1909, 1910, 1911, 1912, and 1913 shows that in Ohio the average farm price per bushel of corn for three years was $0.046 higher than in Illinois, and in New York $0.12 higher than in Ohio. Also, these figures show that the average price per bushel of oats for these years was $0.029 higher in Ohio than in Illinois, and $0.084 higher in New York than in Ohio. These variations are less than those shown by the figures used in this bulletin. This is partly due to the fact that the prices used in this bulletin are averages for a small number of farms, while those shown in the Yearbooks of the

U. S. Department of Agriculture are averages for each entire State. The grain prices shown in Table 5 are influenced also by the relative quantity of ground corn and oats used in the different States.

It is evident that variation in feed prices had a marked influence on the total feed cost per horse in each State group. Aside from this, a study of individual farms shows that different feeding practices also had a distinct bearing on the total feed cost per horse. On some farms practically the same kinds of grain and roughage were fed throughout the year, the quantities of each varying from month to month according to the amount of work done by the horse. On other farms, the grain fed was reduced, and pasture and cheap roughage, such as straw, fodder, etc., were substituted for hay when the horses were not worked regularly. The fact that the cost of feed was more than half of the total cost of keeping a horse should show how important to every farmer is a careful consideration of this subject.

MONTHLY FEED COSTS ON SELECTED FARMS.

In Table 6 are shown the variations in monthly feed costs on three individual farms, one from each of the three States. It will be seen that on each farm the greatest monthly feed costs were for March, April, May, June, and July. For these months, this cost per horse was $7.47 in Illinois, $7.60 in Ohio, and $8.92 in New York; for the remaining seven months, the average monthly feed cost per horse was $3 less in Illinois, $1.47 less in Ohio, and $2.24 less in New York.

TABLE 6.—*Variation in feed costs, by months, on three individual farms located, respectively, in Illinois, Ohio, and New York.*

Month.	Illinois.	Ohio.	New York.
March	$8.68	$7.75	$7.94
April	7.65	7.30	7.68
May	7.34	8.42	10.39
June	6.66	7.30	10.68
July	7.00	7.20	7.93
August	4.70	6.50	7.76
September	4.58	6.66	7.53
October	4.32	6.29	6.23
November	4.67	5.40	6.22
December	4.40	5.70	6.56
January	4.40	5.94	6.56
February	4.23	6.42	5.92
Average	5.72	6.74	7.62

On this particular Illinois farm the kinds of feed and the quantity of each varied considerably according to the work done by the horse. Especially is this true of the pasture which was used from April to November, when the horses were idle. In this State during December, January, and February corn fodder and straw were fed extensively in the place of hay.

On the Ohio farm, from March to August the feeds used were corn, oats, bran, chop, and hay; from September to January corn

fodder was fed in the place of hay; a part of the time in February hay was again substituted for corn fodder. Straw was used for bedding only.

On the New York farm, corn, oats, rye, and hay were fed throughout the year. Greater quantities of these were fed during May and June, while from October to February there was a marked decrease in the quantities fed. As in Ohio, straw was used for bedding only.

LABOR COSTS.

"Labor" includes the number of hours of both man and horse labor devoted to feeding and taking care of the horses, cleaning stalls, hauling feed and supplies, and to any other labor performed for the benefit of the horse. The hauling of manure from the barn and barnyards is not charged against the horses, but becomes a part of the manure cost charged to the crop on which it is applied.

TABLE 7.—*Number of hours, cost per hour, and total cost per horse of man and horse labor devoted to the care of horses, by States (27 farms, 316 horses).*

Kind of labor.	Illinois (154 horses).			Ohio (72 horses).			New York (90 horses).		
	Hours.	Cost per hour.	Total cost.	Hours.	Cost per hour.	Total cost.	Hours.	Cost per hour.	Total cost.
		Cents.			*Cents.*			*Cents.*	
Man labor	85.2	14.95	$12.74	164.6	16.00	$26.34	127.3	16.40	$20.88
Horse labor	13.1	9.56	1.25	8.2	13.90	1.14	8.5	14.22	1.21
Total			13.99			27.48			22.09

Next after feed, labor was the highest item of cost in caring for the horse, varying from 13 to 21 per cent of the total cost in the three States. Of the labor cost, 94.3 per cent was for man labor. It will be seen that the man-labor cost on the Ohio farms was more than double the cost on those in Illinois, and that on the New York farms it was more than one and one-half times the cost in Illinois. Or, in terms of hours, 85 man-hours per year were devoted on an average to the care of each horse in Illinois, while 127 and 165 hours, respectively, were so devoted in New York and Ohio.

A study of the data shows that on an average each horse in Illinois was pastured a greater number of days than in either of the other States, thus requiring comparatively less attention. On the Ohio and New York farms a number of horses were stabled throughout the entire year, and hence required more attention than those on the farms where pasture was used. It also shows that in Ohio the care of horses on some farms was very high as compared with data on other farms in the three States; hence the high average cost for the farms in this State.

The cost per hour of man labor, as determined from these cost-accounting investigations, was found to be 15 cents for the Illinois farms, 16 cents for those in Ohio, and 16.5 cents for those in New York. The proprietor's labor was charged at the same rates.

The cost per hour of horse labor was found by dividing the net cost of keeping the horses by the total number of hours worked by them. The average cost was about 9½ cents for the Illinois farms, 14 cents for those in Ohio, and 14¼ cents for those in New York.

INTEREST ON VALUE OF HORSES.

Although interest is an indirect cost, it must be considered before the total cost of keeping can be determined. This interest cost was figured at 5 per cent of the average value of the horse as shown by the yearly inventories. In the three States studied, interest varied from an average of $7.90 in Illinois to $9.43 in New York. The average values of the horses studied in this work were as follows: Illinois, $158; Ohio, $173; New York, $189.

STABLING COST.

"Stabling cost" concerns that part of the buildings used for stabling horses and storing horse feed, and includes 5 per cent interest on the average investment, insurance, taxes, cash and labor, repairs, and depreciation. In cases where records were not kept for a long enough period to determine the depreciation of buildings, a charge of 2 per cent was made, allowance being made for all repairs that were made during the year. This cost varied from 4.7 per cent of the total gross cost of keeping in Illinois to 8.1 per cent in New York.

USE OF EQUIPMENT.

This item of cost embraces a charge of 5 per cent interest on the average investment in harness and all miscellaneous equipment used by the horses, both cash and labor for repairs, insurance, taxes, and depreciation. Since this equipment is used by the horses alone, its entire cost should be charged to them. In Illinois this cost was about $4 per head, and $1 and $2 higher in Ohio and New York, respectively.

SHOEING.

This item of cost usually represents a direct outlay of cash. On many of the farms this expenditure was of minor importance, since the horses were not shod except when needed for heavy road work or when used on frozen ground. Especially was this true on the Illinois farms, where the average cost per horse was only $0.86 per year. On the Ohio and New York farms it was much higher, being $2.35

and $4.56, respectively, in these States. It is true that on many farms in each State the cost of shoeing individual horses was much greater than the above averages. The fact that on some farms little shoeing was done throughout the year, and on other farms practically the only horses shod were one team for the winter months, would tend to cause a low average cost per horse for each State group.

DEPRECIATION AND APPRECIATION.

In determining depreciation and appreciation in value of horses a yearly inventory value was placed on each horse on the farm by careful appraisal and a record was kept of each horse bought or sold. In Illinois 11 of the 18 yearly farm records showed a net depreciation of horses. In Ohio 7 of the 16 yearly records showed a net depreciation, and in New York 16 of the 18 yearly records showed a net depreciation.

The average net depreciation of the 316 horses was $4.50 per horse.[1] Of this amount $2.70 per horse was due to the death of 9 horses, valued at $855. Depreciation varied from $11.60 per horse in New York to an appreciation of $2.10 per horse in Ohio.

Table 8 shows the percentage of horses that appreciated in value, the percentage that did not, and the factors influencing the aggregate depreciation or appreciation, by States.

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[1] Bulletin 341 of this department shows that the average annual depreciation of horses on 378 farms studied in Chester County, Pa., is $7 per head, and on 300 farms studied in Lenawee County, Mich., $7.10 per head. These figures are largely determined by the practice of farmers in disposing of horses while they are still salable at a fairly satisfactory price, and would undoubtedly be much greater if all farm horses were kept until their usefulness was at an end.

Cornell University (N. Y.) bulletin 377 shows that the average annual depreciation of horses on 14 New York farms for the year 1912, and on 31 New York farms for 1913, was $14.03 and $12.10 per horse unit, respectively. Of the 45 farms studied, 12 showed an appreciation of horses.

Minnesota extension bulletin 15, covering a period of four years, 1904 to 1907, inclusive, gives figures for farms studied in three different counties. In Rice County depreciation varied from $0.98 in 1905 to $15.48 in 1904, averaging for the four years $5.56 per head. In Lyon County depreciation varied from $4.20 in 1905 to $9.86 in 1904, averaging per year $6.94 per head. In Norman County depreciation varied from $2.60 in 1907 to $7.37 in 1904, averaging per year $5.82 per head.

It is pointed out in the text that depreciation of the horse is an expensive item to farmers who are not able to control this expense by means of clever selling methods and by the use of young horses. Shrewd selling, however, does not affect the general principal of depreciation, since thus the loss is passed on to the buyer.

Minnesota experiment station bulletin 145 gives results of a further study of horse depreciation in the above-mentioned counties. Records for Rice County for the period 1908 to 1912, inclusive, shows a variation in depreciation from $0.28 in 1910 to $5.10 in 1909, and an average per year of $3.05 per head. In Lyon County the study covers a period of 3 years, 1908 to 1910, inclusive. The depreciation varied from $1.47 in 1910 to $5.60 in 1909, averaging per year $3.06 per head. In Norman County the work covered a period of 4 years, 1908 to 1911, inclusive. The depreciation varied from $0.51 in 1910 to $3.42 in 1911, averaging per year $1.48 per head. It is pointed out in this bulletin that the annual depreciation as shown above is not high enough to represent a proper average charge through a long term of years. Abnormal conditions in the Minnesota horse market were largely responsible for the low depreciation charge.

TABLE 8.—*Percentage of 316 horses that appreciated in value, percentage that did not appreciate, and the factors influencing the aggregate depreciation or appreciation, by States (27 farms, 316 horses).*

State and number of horses.	Percentage of horses that showed—		Number of deaths.	Number bought.	Number sold.	Number of colts bought.	Number of colts sold.	Number colts fed.
	Appreciation.	No appreciation.						
Illinois (154 horses)	18.75	81.25	3	21	21	2	.....	43
Ohio (72 horses)	21.95	78.05	.....	9	17	2	1	7
New York (90 horses)	4.95	95.05	6	6	3	1	2	18
The three States (316 horses)	15.60	84.40	9	36	41	5	3	68

On the Illinois and New York farms colts became work horses when from 2½ to 4 years of age. The age of work horses that depreciated in value varied considerably, depending on their usage and care. The average age of work horses that appreciated in value was about 4 years. The average age of those that neither appreciated nor depreciated in value was about 8 years, and the average age of those that depreciated in value was about 11 years. In Ohio data showing the age of all the horses studied were not obtained; however, the data that were obtained along this line showed about the same results as those in Illinois and New York.

In Illinois about 19 per cent of the horses appreciated in value at the rate of $36.05 per head per year, while the average depreciation for the other 81 per cent was $12.55 per head. At this rate it will be seen that a $36 appreciation of one horse practically would offset the depreciation of three others. Thus the appreciation of one horse out of every 5.34 kept resulted in an average net depreciation for all horses of but $3.46 per head. Of the 154 horses included in the records from this State 3 died, causing a loss of $350. In other words, the death loss was about 1 out of every 51. In considering the reason for the number of young horses on these farms and the low depreciation of work horses it was found that there was an average of one colt for every four work horses kept. Further, no colts were sold, all being developed into work horses, 11 becoming work horses during the time in which data were collected. It also will be seen that the same number of horses was bought as was sold. Three died and had to be replaced, and a part of the farmers enlarged their business, thus requiring more horses. With the continued raising and developing of colts into work horses, however, it is safe to say that ordinarily a greater number of young horses will be developed than will be needed in the farm business.

On the Ohio farms about 22 per cent of the horses appreciated in value at the rate of $56.90 per head. The average depreciation of

the remaining 78 per cent was $13.30 per head. At this rate the appreciation of 1 horse would offset the depreciation of more than 4 other horses. Thus the appreciation of 1 horse out of every 4.55 resulted in an average net appreciation of $2.10 per head for the total number of horses. While no deaths occurred in this group, 2 horses were severely injured, entailing a loss of $175.

On the Ohio farms there was an average of one colt for every 10 work horses kept. This was about two-thirds less than on the Illinois farms, and yet the depreciation of horses was $5.56 per head less than in Illinois. By this it will be seen that the net appreciation of horses in Ohio was not so much due to the raising of young horses as in Illinois. A study of the data shows that the reason for this was that on some farms a practice was made of buying young horses, and, after working them for a time, selling them at an increase in value. During the years this study was made 9 horses were bought and 17 were sold, 8 of the 17 having been on the farms at the time this work was begun. The horses bought and sold were mostly young draft stock, which accounts for the high appreciation of $56.90 per horse. In following this practice, at times more horses were kept than were needed to do the farm work. Other data in this bulletin show that the average horse worked less hours per year on the Ohio farms than on the Illinois or New York farms.

On the New York farms the relative number of horses that appreciated in value was a great deal less than in each of the other States—less than 5 per cent—at the rate of $44.40 per head. The depreciation per head of the remaining 95 per cent was $14.48. At this rate, the appreciation of one horse would a little more than offset the depreciation of three other horses. Thus, the average net depreciation was $11.56 for all horses. One reason for this depreciation being higher than in the other two States was a loss of $505 due to the death of 6 horses, or about 1 out of every 15. Thus, more than 48½ per cent of the total depreciation was due to deaths. The number of colts on these farms was less than in Illinois. For every work horse sold two were bought. It seems that these farmers have but recently started to replace the old horses by raising colts.

PROFIT AND LOSS ON COLT ACCOUNT.

In determining these items of loss or credit, young stock were considered as colts from the time they were born until they were broken to work. The cost of keeping the colts on each farm was found by the same method followed in arriving at the cost of keeping work horses. This account was credited with the value of manure produced by the colts and their appreciation in value. It was found that colts usually showed a good profit during the first and second years, and under favorable conditions broke about even for the third

year; that is, the increased cost of keep for the third year was not always covered by the increase in value. Of the 43 colts fed on the Illinois farms, 19 were born during the years this work was done. A loss of 4 cents per head on the Illinois farms was due to the deaths of 4 colts valued at $300. In Ohio the loss was higher, averaging $1.24 per head. Of the 7 colts fed, but 1 was born during the period of this work. On the New York farms the colts showed an average profit of $1.43 per head. No deaths occurred, and of the 18 fed, 8 were born during the years of this work.

Under favorable conditions the raising of colts is one way of keeping down the cost of horse labor. (See fig. 1.)

FIG. 1.—Under favorable conditions the raising of colts is one way of keeping down the cost of farm-horse labor.

MISCELLANEOUS COSTS.

"Miscellaneous costs," a minor item, embraces insurance, share of taxes, veterinary services and medicine, salt, etc. The average of these costs per head varied from $1.90 on the Ohio farms to $2.12 in Illinois. The cost in New York was about the same as that in Illinois. The amount expended for this group of items varies considerably on different farms. The variation is, however, in almost direct proportion to the amount expended for veterinary services.

MANURE.

Horses were credited with only the manure recovered from the stables and feed lot, which was valued at $1 per ton before removal.

The amount credited was determined by means of the yearly inventories and a record of the number of tons hauled to the fields.

On the Illinois farms the average manure credit was $5.24; in Ohio, $8.20; and in New York, $13.36 per horse. On individual farms there was a wide variation in the amount of horse manure actually saved. This variation is accounted for to a large extent by the individual practices of manure management, and the extent to which roughage was utilized for feed and bedding purposes.

A study of the average manure credits and their relation to the average amounts of feed used per horse (pp. 3 and 5) shows that the average manure credit per horse is greatest in the States where the horses were fed the greatest quantities of grain and roughage and pastured the least number of days.

VARIATIONS IN NET COSTS.

In Tables 9, 10, and 11, the data for each State are divided into two groups with reference to net costs. The first group includes those years for which the net cost per horse was greater than the average for the State. The second group includes those years for which the net cost per horse was less than the average for the State.

TABLE 9.—*Illinois farms—Itemized average costs and credits for records showing a net cost per horse above the average for the State, and for those showing a net cost per horse below the average* [1] *(10 farms, 154 horses).*

Range of cost.	Feed (cost).	Labor (cost).	Depreciation (cost).	Appreciation (credit).	Colt loss (cost).	Colt profit (credit.)	All other (costs).	Manure (credit).
Above the average cost	$78.05	$16.20	$4.48	.....	$3.92	.....	$21.02	$5.45
Below the average cost	60.00	11.96	2.52	.....	.....	$3.38	18.43	5.06
Difference	18.05	4.24	1.96	.....	3.92	3.38	2.59	.39

[1] Average net cost for the State, $100.65.

One-half of the 18 yearly farm records showed a net cost greater than the average for all records. The average net cost for this group was $118.22 per horse, while the average net cost for the nine yearly records with a cost less than the State average was $84.47, making a difference of $33.75. Of this difference, $18.05 was for feed and $4.24 was for labor. From this it will be seen that the principal difference in cost in this State was for feed, though it naturally follows that a somewhat greater amount of labor will be required for the horses in handling the larger quantities of feed utilized by the better-fed group. The item of depreciation is $1.96 per horse greater than for the low-cost group. The total death loss of $350 for all farms was in this group, and it is interesting to note that, had no deaths occurred, the depreciation would have been greater in the low-cost group. In the high-cost group, there was a

net loss of $3.92 per horse on the colt account, and in the low-cost group a net profit of $3.38 per horse. This makes a difference between the two groups of $7.30 per horse. The greater part of this is due to the death of four colts valued at $300. It will be seen that in addition to the loss of the colts themselves, there was the loss of all feed and attention furnished them. There was a slight difference of 39 cents in the manure credits in favor of the high-cost group.

TABLE 10.—*Ohio farms—Itemized average costs and credits for records showing a net cost per horse above the average for the State, and for those showing a net cost per horse below the average* [1] *(7 farms, 72 horses).*

Range of cost.	Feed (cost).	Labor (cost).	Depreciation (cost).	Appreciation (credit).	Colt loss (cost).	Colt profit (credit).	All other (costs).	Manure (credit).
Above the average cost	$92.12	$31.09	$0.07	.....	$2.86	.....	$27.35	$7.16
Below the average cost	60.01	23.50	.....	$4.50	.....	$0.34	22.57	9.35
Difference	32.11	7.59	.07	4.50	2.86	.34	4.78	2.19

[1] Average net cost per horse for the State, $120.37.

Variations in costs between the two groups on the Ohio farms were found to be similar to those in Illinois. One-half of the 16 yearly farm records showed a net cost greater than the average for all records. The average net cost per horse for this group was $146.33, while the average net cost per horse for the low-cost group of eight records was $91.89. The difference in cost between the two groups was $54.44, which is $20.69 greater than the difference in Illinois. Feed and labor made up $39.70, or 73 per cent of this difference. Here, as in Illinois, it will be seen that these two items are the principal factors controlling variations in cost on the average farm. While there was a slight depreciation per horse in the high-cost group, there was an appreciation of $4.50 in the low-cost group, making a difference in cost of $4.57 per horse. Similar conditions were found regarding loss and profit on the colt account; that is, the high-cost group showed an average colt-account loss of $2.86 per horse, while the low-cost group showed an average profit of 34 cents per horse on this account. The depreciation and appreciation of horses, and the loss and profit on colt accounts, are items worth considering when it is understood that these differences in cost between the two groups were about $8 per horse. The difference in all other costs between the two groups was $4.78. This difference was largely due to the higher cost of interest, shoeing, medicine and veterinary services, stabling, and use of equipment in the high-cost group. Other items of cost, such as taxes, insurance, and miscellaneous, were about the same in each group.

There was an average variation in manure credits of $2.19 per horse, the greatest credit appearing in the low-cost group. This

variation is probably caused by the greater quantities of cheaper roughage fed the horses in this group and due to the fact that the relative amount of manure actually saved varies considerably on different farms by reason of differing methods of manure management.

TABLE 11.—*New York farms—Itemized average costs and credits for records showing a net cost per horse above the average for the State, and for those showing a net cost per horse below the average* [1] *(10 farms, 90 horses).*

Range of cost.	Feed (cost).	Labor (cost).	Depreciation (cost).	Appreciation (credit).	Colt loss (cost).	Colt profit (credit).	All other (costs).	Manure (credit)
Above the average cost	$95.07	$22.76	$13.65	.....	$0.14	.....	$38.54	$12.60
Below the average cost	85.66	21.08	8.52	.....	.....	$3.70	29.64	14.50
Difference	9.41	1.68	5.13	.....	.14	3.70	8.90	1.90

[1] Average net cost per horse for the State, $145.02.

Variations in net costs between the two groups in New York were less than those in both Illinois and Ohio. Eleven of the 18 yearly farm records showed a cost per head greater than the average cost for all records. The average net cost per horse for these 18 records was $157.56, while the average per horse for the remaining 7 records was $126.70, making a difference between the two groups of $30.86. Of this difference $9.41, or less than one-third, was for feed. It will be seen by this that the cost of feeding horses in New York was more nearly uniform than it was in Illinois and Ohio. The difference of $1.68 for labor also was less in this State. The difference in depreciation cost was $5.13. A small percentage of this was due to a greater loss from deaths in the first group. The high-cost group showed an average colt loss of 14 cents per horse, and the low-cost group showed an average colt profit of $3.70 per horse, a difference of $3.84. There were no deaths of colts in either group. The more colts were raised on the farms in the low-cost group. Colts also showed the cheaper cost of keep and the greater appreciation in value in this group. These items, depreciation and appreciation in the value of horses and loss and profit on colt accounts, were, like those for the Ohio farms, of considerable importance. The total difference in cost of these items between the two groups was $8.97 per horse. The principal items under "all other costs" causing the difference of $8.90 per horse were interest, shoeing, stabling, and use of equipment. The difference in manure credits was less than $2. As on the Ohio farms, the credit was greater in the low-cost group.

RELATION OF THE WORK PERFORMED TO THE TOTAL FEED COST.

As previously shown, the greatest item of cost in keeping a farm work horse is for feed. The farmer who gets the maximum amount of work out of his horses, and at the same time has a low feed cost, is reasonably sure of obtaining horse labor at a low cost per hour.

In order to show the relation existing, if any, between the total of work done by a horse and the total cost of feed, the yearly records for each State were divided into two groups with reference to the average total of work done per horse. (See Table 12.) The first group contains the data for those farms on which the horses worked more hours than the average for all records in that State. The second group contains data for those farms on which the hours worked per horse were less than the average for the State group.

TABLE 12.—*Relation of work done to the total feed cost, by States (27 farms, 316 horses).*

Records with work hours per horse—	Illinois (154 horses—average hours worked 1,053).			Ohio (72 horses—average hours worked 867).			New York (90 horses—average hours worked 1,020).		
	Average hours worked per horse.	Average feed cost per horse.	Average feed cost per hour.	Average hours worked per horse.	Average feed cost per horse.	Average feed cost per hour.	Average hours worked per horse.	Average feed cost per horse.	Average feed cost per hour.
Above the average [1]	1,200	$75.20	$0.063	1,055	$89.00	$0.084	1,172	$97.30	$0.084
Below the average [1]	880	67.30	.077	723	67.30	.093	863	85.00	.098
Difference	320	7.90	.014	332	21.70	.009	309	12.30	.014

[1] The number of records included are as follows: "Above the average" in Illinois 8; in Ohio, 7; in New York 9. "Below the average" in Illinois 9; in Ohio 9; in New York 9.

From this table it will be seen that the average feed cost per horse in each State group was greater for those horses that worked more hours than the average for the group, showing that there is a certain relation between the work done and the quantity of feed consumed per horse. Referring to the average feed cost per hour of labor, it will be seen that the excess in feed cost for the harder-working horses was more than offset by the extra number of hours worked by them, so that the average feed cost per hour of labor in this group was about 1½ cents less on the Illinois and New York farms and about 1 cent less on the Ohio farms. A further study of these factors, together with the relation of the total hours of labor worked to the total cost per hour of horse labor on all farms, is shown in fig. 2. Referring to the lower line and each "X" in this graph, it will be seen that while there was a tendency for the feed cost per hour to decrease as the total hours worked increased, on different farms where the horses worked approximately the same number of hours, there was a wide variation in the average feed cost per hour of labor.

This variation was especially noticeable in the case of those horses that worked from 800 to 900 hours per year. In this group the average feed cost per hour varied on different farms from about 4¼ cents to 11¾ cents. On one farm in the group of horses that worked between 500 and 600 hours, the feed cost per hour was 19 cents. This high cost was due to the fact that the horses were fed heavily on the best of feed throughout the year, though working but few hours per day.

On six farms where the horses worked from about 800 to 1,300 hours per year, the average feed cost per hour was less than 5 cents. This low feed cost per hour was largely due to the judicious use of the cheaper grades of feed and pasture on the farm when the horses did light work or were idle, and to the high number of hours worked per day during the busy crop season when the horses were fed greater quantities and higher-priced feeds. These differences in the feed cost per hour indicate clearly that on many farms the importance of light and heavy feeding and the use of the cheaper feeds, according to the amount of work required, is not fully realized.

Figure 2 further shows that on an average on the farms studied there was a fairly uniform difference between the average feed cost and the total cost per hour of horse labor, showing that the number of hours worked and the feed cost per horse are the controlling factors in the total cost per hour of horse labor.

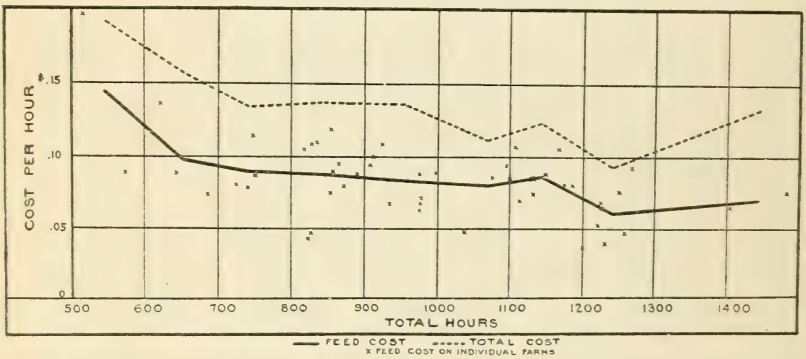

FIG. 2. Relation of total hours worked to feed cost and to total cost per hour of horse labor, for all farms.

COST OF HORSE LABOR PER HOUR.

The cost of horse labor per hour depends on the net cost yearly to keep a horse, and the total amount of work done. (See Table 13.)

TABLE 13.—*Cost of horse labor per hour (27 farms, 316 horses).*

State.	Average hours worked.			Average net cost per horse.	Average cost per hour worked.
	Per year.	Per week day.	Per Sunday.		
					Cents.
Illinois (154 horses)	1,053	3.30	0.40	$100.65	9.56
Ohio (72 horses)	866	2.70	.46	120.37	13.90
New York (90 horses)	1,020	3.24	.13	145.02	14.22

From the averages shown in Table 13 it will be seen that in all cases under consideration the average cost of horse labor is over 9½ cents (on the New York farms over 14 cents), while in no instance

does the average time worked per week day rise above 3⅓ hours. It may be noted, as illustrative of the application of these figures, that if the New York and Ohio farmers concerned had hired their horses out at 10 cents per hour, and had failed to work them more than 1,020 and 866 hours per year, respectively, they would have lost on each horse about 4 cents per hour worked.

Of the various ways of keeping down the cost of horse labor, one of the best is to keep the horses busy (see fig. 3).

FIG. 3.—Of the various ways of keeping down the cost of horse labor, one of the best is to keep the horses busy.

LABOR PERFORMED, BY MONTHS.

In figure 4 is shown the average work done per horse, by months, for each State group.

Referring to this graph, the general importance of horse labor on these farms for May, June, and July will be seen. In each State very little labor was performed by the horses during January, February, and March. Thereafter the work increased until, during May, the maximum for any one month was reached. From then on to the end of the year there was a fairly uniform decrease in the hours worked per month. In New York and Illinois the increases in October and November are due to grain threshing and corn harvest.

On the Ohio farms, with few exceptions, the average total of labor performed each month was less than on the Illinois and New York farms. Also, it will be noticed that during April, May, November, and December the horses on the Illinois farms worked more hours per

horse than those in New York, while the horses on the New York farms did the greatest amount of work between June and November.

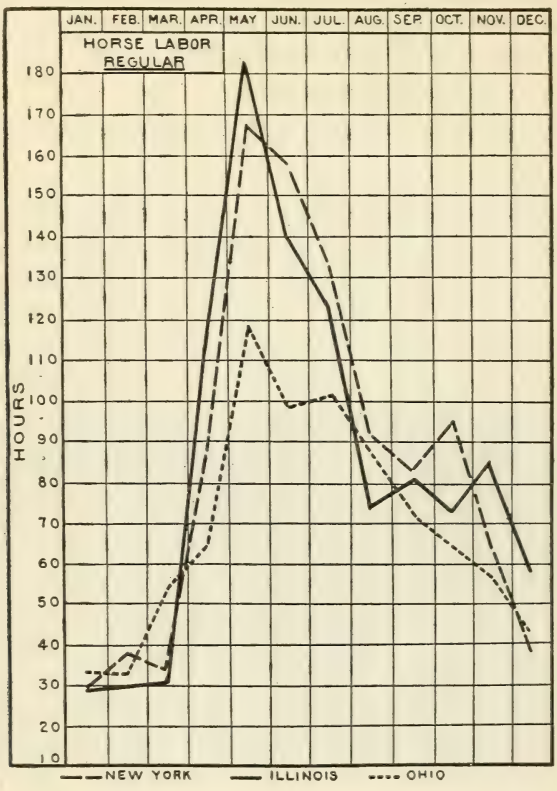

FIG. 4.—Average number of hours worked per horse, by months.

Referring to figure 5, in which is shown the extra horse labor used on the farms studied, it is found that in Illinois the greatest amount of extra horse labor was required during August. In Ohio and New York the greatest amount appears in October. This extra horse labor was usually exchange work among neighbors, the major part being used in grain threshing, corn harvest, and fall seeding.

NUMBER OF IDLE WEEK DAYS PER YEAR.

As previously shown, each horse worked approximately three and one-fourth hours per week day on an average throughout the year. There were, however, on all of the farms a few week days in every month when no horse labor was performed. (See Table 14.) In each State over 50 per cent of the total number of week days during which no horse labor was performed are found in the months of January, February, March, and December. For the remainder of the year the week days when no labor was performed varied for different months

and in different States from about 1 day to 5¾ days per month. On an average the horses were idle the fewest days in Illinois and the most in New York. Weather conditions and the farming systems followed were influencing factors in this variation from month to month.

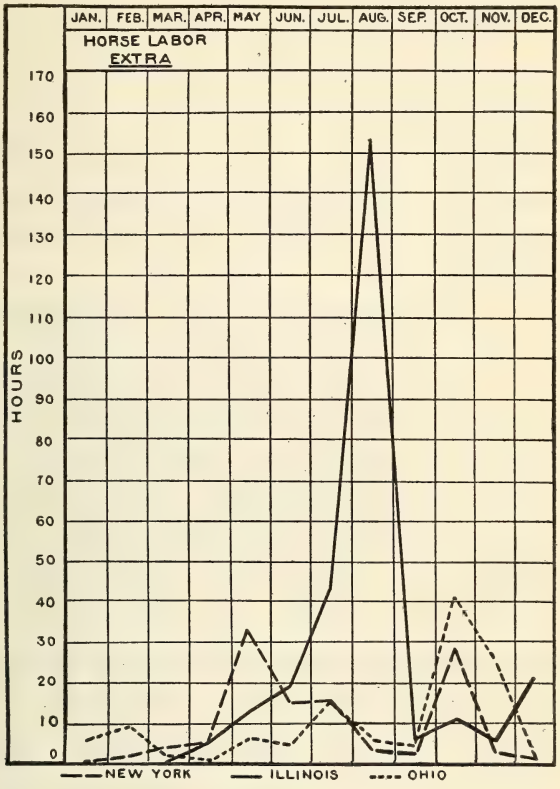

FIG. 5.—Average number of total hours of extra horse labor employed, by months.

TABLE 14.—*Average number of week days when no horse labor was performed, by months.*

Month.	Illinois (10 farms).	Ohio (7 farms).	New York (10 farms).
January	8.3	9.7	12.4
February	5.8	7.0	9.5
March	7.0	6.8	12.0
April	2.7	4.6	4.6
May	5.0	2.2	1.3
June	1.1	2.5	1.2
July	1.2	3.1	1.5
August	3.8	2.1	5.3
September	3.0	4.0	3.5
October	3.5	5.4	4.8
November	1.9	3.5	5.8
December	5.1	7.6	11.3
Total	48.4	58.5	73.2

RELATION OF TOTAL CROP ACRES PER FARM TO CROP ACRES PER HORSE.

It has been shown that on an average the feed cost and total cost per hour of horse labor on the farms studied decreased as the number of hours worked per horse increased. The amount of work required per horse depends on the size of the business and the number of horses on the farm. On most of the farms included in this study the size of the business depended largely on the number of crop acres in the farm; that is, acres under cultivation. It is true that a great deal of horse labor other than crop labor was performed on these farms, but it is safe to say that in every case the horses required to tend the crops during the crop season could easily do all other necessary labor.

The relation of crop acres per farm to crop acres per horse is shown in Table 15, by States.

TABLE 15.—*Relation of total crop acres per farm to crop acres per horse, by States (37 farms, 316 horses).*

Farms.	Illinois (10 farms—average size, 166 acres).		Ohio (7 farms—average size, 74 acres).		New York (10 farms—average size, 94 acres).	
	Average per farm.	Average per horse.	Average per farm.	Average per horse.	Average per farm.	Average per horse.
	Acres.	*Acres.*	*Acres.*	*Acres.*	*Acres.*	*Acres.*
Farms above the average size	230.2	22.2	93.7	17.8	112.74	20
Farms below the average size	111.2	16.8	54.7	14.6	70.07	17
Difference	119.0	5.4	39.0	3.2	42.67	3

From these figures it appears that the large farms permit of a more efficient use of horse labor than do the small farms. On the large farms in Illinois there were 22.2 acres in crops per horse, while on the small farms there were but 16.8 acres per horse. Similar results were found on both the Ohio and the New York farms, though in these States the difference between the two groups was not as great as in Illinois.

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